REMARKS

In the patent application, claims 3-17, 20-23, 25 and 27-30 are pending.

In the office action, all pending claims are rejected.

At section 4, claims 3-7, 9-17, 20-23, 25 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Koto et al.* (U.S. Patent Application Publication No. 2003/0215014 A1, hereafter referred to as *Koto*), in view of *Kim et al.* (U.S. Patent Application Publication No. 2003/0123539 A1, hereafter referred to as *Kim*).

In rejecting claim 4, the Examiner states that *Koto* discloses a method for video encoding wherein M reference frames are selected for a given original frame and each frame is partitioned into a plurality of blocks so as to obtain the block difference based on a summation of differences between a block in the original frame and the blocks in the reference frames. The Examiner states that *Koto* does not specifically disclose using the absolute values of the differences in the summation, but points to *Kim* for disclosing computing motion vectors using the sum of absolute difference (*SAD*) based block matching scheme (paragraph [0017]), and the *SAD* calculation compares current reconstructed previous luminance samples on a pixel-by-pixel basis (Equation 2; paragraphs [0018]-[0022]). The Examiner further states that it would be obvious for a person skilled in the art to combine the SAD calculation of *Kim* with the coding scheme of *Koto* in order to provide a system capable of adaptive quantization having all the features of claim 4.

On page 2 of the final office action, section 2, the Examiner again states:

> *Koto* discloses "calculating a linear sum of the reference macroblocks using weighting factors to generate a predictive macroblock" (paragraph [0012]). *Koto* more specifically, with reference to Figure 1, states: "The predictive macroblock selector 120 calculates the difference between <u>each of the predictive block signals 130 to 133 generated by the predictive macroblock generator 119 and the video macroblock signal extracted from the input signal video signal 100, and selects one of the predictive macroblock signals which exhibits a minimum error for each video macroblock</u>" (paragraph [0059]), indicating calculating a

difference. Calculating a sum of absolute differences, as disclosed by *Kim*, is a linear operation and also falls under the characterization of calculating a difference disclosed by *Koto*.

Furthermore, the Examiner points to paragraph [0146] to show that *Koto* discloses optimizing the offset at least partially based on the block difference.

In paragraph [0146], *Koto* discloses:

> In order to obtain optimal motion vector for the macroblock 10, motion vector candidates (motion vector candidates 11 and 15 in Figure 24) for the reference frame F1 within in a search range and the motion vectors (a motion vector 13 obtained by scaling the motion vector candidate 11 and a motion vector 17 obtained by scaling the motion vector candidate 15 in Figure 24) obtained by scaling the motion vector candidates in accordance with the inter-frame distance are used as motion vectors for the reference frame F0. A predictive macroblock is generated from the linear sum of the reference macroblocks 14 and 12 or 16 and 18 extracted from the two frame memories F0 and F1. The **differential value between the predictive macroblock and the to-be-encoded macroblock 10** is calculated. When this differential value becomes minimum, the corresponding motion vector is determined as a motion vector search result for each macroblock.

In the above passage, *Koto* describes the search for the minimum value of the block difference (differential value) between the predictive macroblock (signal 106) and the signal 100 (to-be-encoded macroblock). The search result is dependent on the signals 130-133.

The prediction picture signal 106 is the output of the predictive macroblock selector 120. The predictive macroblock selector 120 calculates the difference between each of the predictive block signals 130 to 133 generated by the predictive macroblock generator 119 and the video macroblock signal extracted from the input signal video signal 100, and selects one of the predictive macroblock signals which exhibits a minimum error for each video macroblock (paragraph [0059]). Thus, the prediction picture signal 106 is one of:

A) the predictive block signal 130 and the video signal extracted from the input signal video signal 100, wherein the predictive block signal 130 is a reference macroblock

signal 104 extracted from the reference frame stored in the first reference frame memory 117 (paragraph [0058]);

B) the predictive block signal 131 and the video signal extracted from the input signal video signal 100, wherein the predictive block signal 131 is a reference macroblock signal 105 extracted from the reference frame stored in the second reference frame memory 118 (paragraph [0058]);

C) the predictive block signal 132 and the video signal extracted from the input signal video signal 100, wherein the predictive block signal 132 is generated by averaging the reference macroblock signals 104 and 105, respectively extracted from the first and second frame memories 117 and 118 (paragraph [0058]); and

D) the predictive block signal 133 and the video signal extracted from the input signal video signal 100, wherein the predictive block signal 133 is generated by subtracting the reference macroblock signal 105 extracted from the second reference frame memory 118 from the signal obtained by doubling the amplitude of the reference macroblock signal 104 extracted from the first reference frame memory 117 (paragraph [0058]).

The summing device for producing the predictive block signal 132 computes the predictive picture signal by averaging the reference macroblock signals 104 and 105, respectively extracted from the first and second frame memories 117 and 118 (paragraph [0058]). In computing the predictive block signal 132, two past frames F0 and F1 stored in the reference memories 1 and 2 are involved.

The summing device for producing the predictive block signal 133 subtracts the reference macroblock signal 105 extracted from the second reference frame memory 118 from the signal obtained by doubling the amplitude of the reference macroblock signal 104 extracted from the first reference frame memory 117 (paragraph [0058]). In computing the predictive macroblock signal 133, two linear predictive coefficients (W0, W1) = (-1, 2) are used when the frame distance Rb is constant and is twice the frame distance Ra (see Figure 20). Reference symbols Ra and Rb denote the inter-frame distances between the respective reference frames F0 and F1 and the video frame F2. The two past frames F0 and F1 are stored in the reference memories 1 and 2 (Figures 1 and 2; paragraphs [0129], [0130]).

<u>Proposed Combination of *Koto* and *Kim* would change the principle of operation of *Koto*</u>

In the method as disclosed in *Kim*, only **one** past reference frame is used to compute the block difference. As shown in Equation 2, the macroblock luminance samples of the **to-be-encoded macroblock** are denoted by *C[i, j]*, and the luminance samples of **one** past frame (reconstructed previous frame) are denoted by *R*. In particular, the absolute difference between *C[i, j]* and *R* is used to compute the block difference.

According to *Koto*, the predictive picture signal 106 that is used to compute the block difference (the predictive error 101) is selected from signals 130-133 by the predictive macroblock selector 120, wherein signal 105 is from the most recent past frame extracted from frame memory 2.

If one skilled in the art tries to modify the encoder as disclosed in *Koto* so that the block difference is computed based on **only one** past frame as disclosed in *Kim*, then the signals 130, 132 and 133 in *Koto* will no longer be useful. Thus, the predictive macroblock selectors 120, 220 as shown in Figures 1-3 are no longer useful. The fade-detector 140 in Figure 2 is no longer useful. Likewise, the predictive macroblock selectors 150, 250 in Figures 8 and 9 are also useless. As a result, <u>the error for each video macroblock is derived from one signal 131 alone</u>. This would drastically change the principle of operation of the encoder as disclosed by *Koto* wherein the predictive macroblock selector 120 calculates the difference between **each of the predictive block signals 130 to 133 generated by the predictive macroblock generator 119** and the video macroblock signal extracted from the input signal video signal 100, and **selects one of the predictive macroblock signals** which exhibits a minimum error for each video macroblock.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. MPEP 2143.01 VI.

For the above reasons, *Koto*, in view of *Kim*, fails to render claim 4 obvious.

For the same reasons, *Koto*, in view of *Kim*, also fails to render independent claim 21 obvious.

In rejecting claim 7, the Examiner states that *Koto* discloses that the weighting factor in the weighted sum is determined partially based upon a quantizer parameter or the index of reference frame (paragraphs [0081]-[0084]).

As amended, claim 7 includes the limitation that the index is indicative of a variance in the block differences. It is respectfully submitted that, the code-index as

disclosed in *Koto* is used to indicate the position of the reference frame relative to the current frame (Figure 5), the weight-type (Figure 6) or the number of frames back (Figures 7 and 11). *Koto* does not disclose using an index to indicate the variance in the block differences.

For the above reason, *Kim*, in view of *Koto*, fails to render claim 7 obvious.

For the same reasons, *Kim*, in view of *Koto*, fails to render claim 28 obvious.

In rejecting claim 10, the Examiner states that *Koto* discloses that the set of M reference frames is divided into N sub-sets, such that each of the M reference frames belong to precisely one of the N sub-sets so that the optimal offset is computed for each of the N sub-sets (Figure 11). Applicant respectfully disagrees.

It is respectfully submitted that *Koto* discloses that the position of the reference frame relative to the current frame can be indicated by a code number. For example, when the code-number is equal to 2, the reference frame is 2 frames back. *Koto* does not disclose that the reference frames are divided into sub-groups and the minimum shift is obtained for each sub-group.

For the above reasons, *Kim*, in view of *Koto*, fails to render claim 10 obvious.

For the same reasons, *Kim*, in view of *Koto*, fails to render claims 15, 29 and 30 obvious.

Furthermore, claims 3, 5-17, 20, 22, 23 and 25 are dependent from claims 4 and 21 and recite features not recited in claims 4 and 21. For reasons regarding claims 4 and 21 above, claims 3, 5-17, 20, 22, 23 and 25 are also distinguishable over the cited *Kim* and *Koto* references.

Additionally, claims 13, 14 are dependent from claim 10 and recite features not recited in claim 10; and claims 16, 17 are dependent from claim 15 and recite features not recited in claim 15. For reasons regarding claims 10 and 15 above, claims 13, 14, 16 and 17 are also distinguishable over the cited *Kim* and *Koto* references.

As for claims 31 and 32, they are dependent from claim 4 and recite features not recited in claim 4. For reasons regarding claim 4 above, claims 31 and 32 are also distinguishable over the cited *Kim* and *Koto* references.

Additionally, claims 31 and 32 include the limitation that the weighted sum is determined at least partially based on a quantizer parameter of the reference frame.

Neither *Kim* nor *Koto* discloses this limitation. Thus claims 31 and 32 are distinguishable over the cited *Kim* and *Koto* references.

CONCLUSION

Claims 3-17, 20-23, 25 and 27-32 are allowable. Early allowance of all pending claims is earnestly solicited.

Respectfully submitted,

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